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THE

MALAYAN AGRICULTURAL JOURNAL

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DEPARTMENT OF AGRICULTURE, FEDERATION OF MALAYA.
Kuala Lumpur.

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THE

Malayan Agricultural Journal

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EDITORIAL

Off-Season Padi-Growing at Salor, Kelantan.

Although double-cropping is not new to Kelantan, it is rarely undertaken due to the shortage of rain-water during the off-season. The completion of an irrigation scheme in the Salor area in 1951 gave the farmers there an opportunity to plant a short-term crop after the main season padi had been harvested. This opportunity was not taken however, and the State Agricultural Officer, Kelantan, decided to carry out a trial with short-term padi on the farmers' own land in early 1953 to prove to them that a valuable crop could be grown. Padi was the crop chosen because (i) the Department of Agriculture gives priority to increasing padi production in Malaya, and (ii) there are no extensive areas of good wet padi land in Kelantan that have not been alienated or are left unplanted during the main season.

The trial, which is described in the first article in this issue of the Journal, did not, it was felt, receive maximum co-operation from the farmers, the principal reason being that they did not believe a worthwhile crop could be grown in the off-season. However, a crop was grown and although the average yield was not high there were indications that it would have been much higher if the cultivators had given of their best.

The trial was carried out on an area of a little over 100 acres and showed that an obstacle to applying the results of the trial to the whole of the irrigated area (some 3,000 acres) would be the means by which the land could be cultivated immediately after harvesting the main padi crop. Mechanical cultivation is possible, but with the short period of time available for cultivation very large numbers of tractors and implements would be needed for large areas. Buffalo-cultivation would be the most suitable method of preparing the land for an off-season crop, but in Kelantan, where farmers do not grow a crop of fodder for their cattle, the buffalo is worked hard during the main season and is usually not in fit condition to work the fields in the off-season, at which time, under present arrangements, the animal is grazing and recuperating on the dry land. However, as Mr. Ashby says in his article, the difficulties of providing more fodder and increasing the livestock population are not insuperable and, with organisation amongst the farmers, double-cropping in Salor and other similar areas has distinct possibilities.

Soils of the Netherlands. While he was on leave in the United Kingdom, Mr. Coulter, the Acting Senior Chemist (Soils), took the opportunity of visiting the Netherlands to see some of the work being done on peat soils and to examine the highly sulphurous clays which are found in certain areas. Both soil types occur in Malaya and have received considerable attention from officers of the Department. In addition, Mr. Coulter visited areas which have been reclaimed, the Soil Survey Institute at Bennekom, and several research laboratories.

Mr. Coulter has written a paper describing the things he saw in the Netherlands, and it is being published in this Journal in two parts. The first part, dealing with peat and sulphurous soils, can be found on later pages; the second part, covering soil survey, land reclamation and drainage and soil research in the Netherlands, will appear in the April issue.

Smallholding Rubber. Mr. Cook, in his article on the marketing of smallholding latex in the July, 1953, issue of this Journal, suggested that the Technical Classification Scheme had not been extended to smallholders' rubber up to 1952. The table given below indicates that smallholders' rubber was being technically classified in early 1952. The method adopted to produce satisfactory uniformity between bales in a consignment was the controlled blending of loose sheet in the packing house. The major portion of the quantities given below comes from smallholders in the Federation of Malaya.

The figures for 1953 are included for information. They are not relevant to Mr. Cook's article which covered the period 1950 to 1952 only.

Month	Estimated Production of T. C. R. from Packing Houses.	
	1952	1953
	tons	tons
January	nil	67
February	nil	10
March	nil	20
April	28	165
May	nil	132
June	nil	198
July	54	41
August	50	131
September	15	79
October	70	154
November	79	166
December	114	200 *
Total	410	1,363

* Estimated production up to 10th December, 1953, was 73 tons.

Recently it has proved possible to apply technical classification to remilled rubber by a similar blending process, thus even the smallholders' scrap may be sold as T.C.R.

OFF-SEASON PADI TRIALS IN THE SALOR IRRIGATION AREA, KELANTAN, IN 1953

BY

H. K. ASHBY,

State Agricultural Officer, Kelantan.

Introduction.

The Salor Irrigation Area is served by one of two pumping sets in Kelantan, and abundant irrigation water from the Kelantan River can be supplied to the land at any time of year. Completion of the irrigation scheme by the Drainage and Irrigation Department in 1950 gave the smallholders in the area a complete independence of rainfall, which immediately permitted them to commence the planting of the main crop of padi on any specified date and, given a reasonable consistency of choice of type of padi by the smallholder, enabled the padi harvest date to be determined with certainty.

Up to the present time, no use has been made of the land within the irrigation area during the off-season except to provide rough grazing for cattle, which are customarily let loose on completion of padi harvest to wander over the ground, and this in itself was a deterrent to anyone who might contemplate the cultivation of some form of off-season crop, as the risk of damage from cattle was high.

In a normal year, rainfall in Kelantan during the period March to July is insufficient to ensure the establishment and satisfactory growth of dry land crops on a field scale, and experience on Experiment Stations has shown that rainfall must be supplemented by either hand watering or irrigation. On the smallest scale, hand watering is sometimes practicable, but it is not so when the crop is being grown at any distance from the landowner's house, as wells do not exist in the padi fields. Completion of the irrigation scheme greatly raised the value of the land, the fertility of which is high by Kelantan standards, not only by its effect on the yields of the main padi crop, but also by preparing the way for a more intensive system of cropping which might include both wet and dry land crops during the off-season.

Great importance is attached to increasing the production of padi in Malaya. In Kelantan, no extensive areas of good wet padi land are left unalienated or unplanted, and a local increase in padi production is almost wholly restricted to that obtainable from increased yields. Substantial increases are obtainable from the use of fertiliser, and may also be obtainable in future from the use of selected strains of padi, and it appeared likely that large benefits could result from double cropping with padi, particularly where such could be done in some of the highest yielding parts of the State.

Preliminary Investigations.

The principle of double cropping with padi is not new to the State, as for some years since the war it has been undertaken in Daerah Kemumin, although the belief had grown that the variety of padi planted there would not succeed in other areas further from the sea. The basis for this belief appeared to be founded on slender evidence. Accordingly, during the transplanting of the 1952-53 main padi crop, a quantity of nursery seedlings of Taiwan padi (Taichu 65) were raised on Kota Bharu Experiment Station and issued free to smallholders in the Salor Irrigation Area with the request that each should plant a few score seedlings on their land in order to determine whether or not Taichu 65 would grow normally during the main padi season. These plants grew and yielded satisfactorily, and the observation plots showed quite clearly that Taichu 65 was suited to the area when planted during the main padi season, and that the planting of this variety during the off-season did not present any undue risk.

The decision was therefore taken to embark on the planting of Taiwan padi as an off-season crop early in 1953, on a scale sufficiently large to avoid total destruction of the crop by birds or other pests.

An area of 104 acres lying close to the main irrigation canal at a short distance from the Pump House, and where there was a fair-weather access along an earth road for tractors and vehicles, was selected for the trial planting of the off-season crop. Reference to land records showed that this area was divided into 199 Lots, registered in the names of some 66 persons, but on the ground it was found that so much sub-division of the Lots had taken place that there were actually well over 300 pieces (*keping*) of land, the average area of which was therefore between one-third and one-quarter of an acre.

After tracing the owners, negotiations with them were commenced late in 1952, and several meetings were held at which it was explained that the co-operation of the landowners was sought in the growing of a trial off-season crop of padi. These meetings afforded an opportunity for full discussion of the proposals, which were met with scepticism, and there were many very frank interchanges of views on the difficulties that were raised. Mention is made of some of these below.

Cultivation of the Land.

Landowners were asked how many cattle or buffaloes they possessed. Twenty-seven persons said that they had none; twenty-one stated that they owned one head only; and only eighteen persons admitted ownership of a pair. The explanation given for the small number of animals was generally that on completion of planting of the main crop of padi there was insufficient grazing land or fodder in the locality, and that it was customary to sell off some or all of the livestock to persons in other parts of the State who had access to better facilities.

It was generally agreed that the land was likely to be too hard to plough immediately after harvest with cattle-drawn ploughs, and some of

the smallholders doubted their ability to plough fresh stubble even if the land itself was not too dry. It appeared therefore that all the land would have to be ploughed by the Department of Agriculture with mechanical equipment, and as so few cattle were available it was evident that arrangements would have to be made to do the after-cultivation by mechanical means as well. Very few offers of help with the after-cultivation were made by the smallholders who did possess cattle, their principal objection being that were they to use their animals, which were then in fairly poor condition, for the cultivation of the land in the off-season, they would be in no fit state to undertake the preparation of the land for the main padi crop when the time came.

PREPARATION OF NURSERIES.

Smallholders were unanimous in their opinion that nurseries could not be grown during the dry season. While this may be true for the dry nurseries habitually used by Kelantan padi planters, it is certainly not true of the wet type of nursery of which they had had no personal experience. The smallholders were also of the opinion that a good crop of padi could not be grown on any nursery site, and no one was at first willing to allow his land to be used for a nursery. The matter was settled by accepting the preparation and establishment of nurseries as a responsibility of the Department of Agriculture.

MANURING.

The Department proposed that a free issue should be made of the Standard Manurial Mixture used in Kelantan, for application to all the land at the rate of 200 lbs. per acre, and an additional 100 lbs. per acre on the less fertile parts. This was not generally welcomed, as most planters asserted that far from increasing the yields it would decrease them, their land being so fertile that manuring would only lead to excessive vegetative growth and small ears.

IRRIGATION WATER.

The full cost of this was to be met by the Department of Agriculture.

TRANSPLANTING.

There was a certain amount of reluctance on the part of smallholders to agree to undertake the pulling of nursery seedlings and their transplanting in the field, mainly it seemed on the grounds that they felt that they were in need of a long rest after harvesting the main crop a few weeks before. Those who did agree did so probably in the belief that the nursery seedlings would never be grown, while those who did not probably felt that there was not the smallest chance of the padi crop reaching maturity before the land would be due to be ploughed for the next main crop of padi when, they made it clear, they would eradicate the off-season crop if it had not been harvested.

HARVESTING.

Smallholders agreed to do this themselves, and to surrender 10 per cent. of the harvested crop to the Department to meet possible seed requirements later. There was, however, a small demand for the complete mechanisation of harvest which would have been welcomed had not the the fields been of such small size, and were there not the likelihood of irregular planting and ripening and trouble over the allocation and distribution of the bulked crop.

Field Work.

Ploughing of the land commenced on the 8th March, 1953, by which time part of the main crop in the area had been harvested, and the tractors were working alongside the harvesters busy in the fields. The harvesting methods used were either by *ketaman* *, which left the straw standing after the removal of the ears, or by a sickle and threshing box which left a shortish stubble and piles of straw. Either method necessitated burning off the straw before ploughing, and this was done more easily in the lower-lying, wetter areas where the straw had been left standing. At first, two Ferguson tractors mounted on standard steel wheels and drawing two-furrow semi-digger ploughs were engaged on ploughing to a depth of about 4 ins. These were later supplemented by a Fordson tractor drawing a three-furrow mounted plough. Ploughing was completed on the 11th April, the 104.80 acres having taken 325.83 tractor-hours to plough, equivalent to 3.11 tractor-hours per acre.

The rather heavy, clay soil dried out very rapidly and set hard after ploughing, so much so that it was considered advisable to disc-harrow all the land prior to running on the irrigation water. Two Fergusons, two Fordsons, and one Farmall "A" tractors were used, and they completed the work in a total of 214.42 tractor-hours, equivalent to 2.05 tractor-hours per acre. With better organisation it might have been possible to do the ploughing under wetter conditions, and to have maintained the land under water as soon as it had been ploughed, with the elimination of disc-harrowing; however, with irregular harvesting, the high cost of running large pumps for a small area, and the difficulty of adequate local water control within small areas, it was not considered practicable to do so under the conditions of this trial. The condition of the land at the commencement of disc-harrowing is shown in Plate I. Disc-harrowing was commenced on the 22nd March, and completed on the 16th April, 1953.

After-cultivation in the wet was undertaken with the aid of specially built, fully-mounted rolls fitted to the two Ferguson and two Fordson tractors. These rolls were designed and built by the Department of Agriculture, and proved to be of great value for the final breaking down of the furrow slices and levelling of the land, as they could be operated in both a forward and backward direction into the extreme corners of a field. Their use is illustrated in Plate II. Plate III shows the condition of the land on completion of rolling. Many of the lumps of

* Harvesting with a small knife with which the crop is cut ear by ear.

PLATE I.

The state of the land at the commencement of disc-harrowing.

PLATE II.

After-cultivation with a roll designed and built by the Department of Agriculture.

PLATE III.

The state of the land after rolling.

PLATE IV.

Fertiliser being delivered to the distributing centre.

soil shown in this photograph broke down completely on standing under water. Rolling was commenced on the 18th April and was completed on the 10th May, having taken a total of 246.17 tractor-hours, equivalent to 2.35 tractor-hours per acre.

An issue of Standard Padi Manure was made to each cultivator shortly before transplanting was due to commence, the quantity being sufficient for an application of 200 lbs. per acre immediately before transplanting. This manure was delivered to the distributing centre by a Departmental tractor and trailer as shown in Plate IV. The method and rate of application were explained to each cultivator, and although some of it was applied broadcast to the surface of the land on completion of rolling, there were very good grounds to suspect that a great deal of it was never applied, but was hidden away and hoarded for the main padi crop. Plate V shows the application of manure to the land.

Three sets of wet nurseries were established by the Department at Salor on land that had been manured with 200 lbs. Standard Padi Manure per acre, and a fourth was laid down at Kota Bharu Experiment Station in the event of there being any trouble or difficulty at Salor. Sowing dates were the 4th, 7th, 11th and 12th April. Seed of Taichu 65 was not available in quantity, and resort had to be made to a similar variety, Pe Mi Fun, of which 400 gantangs (gallons) were obtained from the Settlement Agricultural Officer, Penang. The nurseries at Salor were completely surrounded with fine mesh wire netting to deter the numerous ducks from entering the area. Many of the smallholders had the nursery seedlings pulled for them on contract by a party of women, and it was gratifying to hear it said that they had never handled seedlings which were better grown or as easy to pull. Some of the nursery pulling work is shown in Plate VI.

Transplanting was commenced on the 29th April, and completed on the 17th May, the age of nursery seedlings therefore varying between 25 and 35 days, which is on the high side for a very short-term padi.

The whole area of 104 acres was surrounded by a fence consisting of two electrified wires carried on insulators mounted on jungle poles, construction of which was complete by the time transplanting commenced. It provided reasonably effective protection from damage by cattle and buffaloes, and therefore served the purpose for which it was provided. It was, however, frequently out of order due to deliberate earthing of the wires, and to the fact that the Kelantan craze for *kampong* * telephones had just started, and lengths of wire were removed for that purpose.

The progress made by the growing crop was very variable. A proportion of the fields carried padi which grew satisfactorily; this was attributed to the smallholders having applied to the land the manure issued to them, as well as to their having transplanted promptly after the completion of cultivation, and to water having been maintained on the land. Fields on which growth was less good were generally dry and full of weeds, the dryness being due to failure to maintain *batas* † in

* A village.

† Bunds round wet padi fields.

good order. A frequent cause of loss of water from damaged *batas* derived from the operations of persons catching fish in the padi fields, as is customarily done during the main padi season. While this may not be a serious matter during a season of heavy rainfall, it may be disastrous during the dry season.

By the end of May it was clear that additional manuring would have to be undertaken, and arrangements were made for the remaining 100 lbs. per acre of manure to be applied to the poorest fields by Department labour, to ensure that the manure was indeed applied to the land.

Throughout the growing season smallholders themselves, practically without exception, never visited their land to see how the crop was progressing, nor did they appear to take the slightest interest in it. The belief appeared to be widespread that there was no hope of any crop being raised, and no one, it seemed, was prepared to do anything which might have improved the growth of the crop. This belief persisted until long after the crop came into ear, and it was not until harvest had commenced that anyone admitted of the possibility of any grain being harvested.

Flowering commenced at the beginning of July, and thereafter *kesing* (*Leptocorisa acuta*) became more numerous, so that dusting with BHC and DDT was undertaken. Up to that time pests had not been troublesome, although there had been a small outbreak of *kutu beruang* (Scotinophora) not long after transplanting.

Ripening and harvesting of the padi commenced late in July and was completed by the 18th August, the crop having been in the field for three calendar months.

Crop cutting tests were made by staff of the Department, and from a total of 218 such tests, with sample plots of 1/180th acre each, the mean yield of padi was found to be 169.09 ± 4.31 gantangs per acre. Bird damage was relatively slight, but losses from *kesing* were widespread, and were estimated to amount to 33.42 per cent. of the crop.

Water Consumption.

Full records were kept of the number of acre-inches of water taken by the crop, covering both rainfall and the quantity of water supplied by pumping. In the case of the pumped water, the supply in acre-inches was calculated by dividing the total quantity of water pumped by the area under cultivation, i.e. 104 acres.

The first period of pumping, from the 30th March to the 10th April, was directed towards the preparation and maintenance of the nursery area only, during which time 8.31 acre-inches were supplied by pumping and 1.14 acre-inches by rainfall. As the nursery area was only of the order of four to five acres, it is apparent that the running of a large irrigation scheme for the benefit of a small nursery area is a thoroughly wasteful operation.

The second period of pumping, from the 11th April until the 2nd July, was directed towards the inundation of the land and maintaining it as near as possible in a flooded condition until flowering had commenced.

PLATE V.

Applying the fertiliser to the land.

PLATE VI.

Pulling seedlings in the nursery.

PLATE VII.

A well grown crop of padi nearly ready for harvest.

PLATE VIII.

A low yielding patch, short of water and smothered with weeds.

In Table I, details are given of the water supplied to the fields proper during successive periods of 14 days each, from which it will be seen that once the fields had been thoroughly soaked and transplanting had been completed, the water requirement settled down to a total of 10 to 12 acre-inches per fortnight.

Table 1.

Water Consumption in Acre-Inches. (Excluding Nurseries).

Period.	Water Due to Rainfall.	Water Due to Pumping.	Total.
11th to 24th April	2.01	25.10	27.11
25th April to 8th May	2.65	14.35	17.00
9th May to 22nd May	8.67	2.20	10.87
23rd May to 5th June	8.96	1.90	10.86
6th June to 19th June	0.98	11.55	12.53
20th June to 3rd July	2.21	10.40	12.61
4th July to 13th July	Nil	Nil	Nil
Total	25.48	65.50	90.98

Summary and Discussion.

The trial effectively demonstrated that it is possible to grow an off-season crop of short-term padi in an inland area in Kelantan where there is an assured supply of irrigation water. The average yield was not high, and was comparable to that obtained from a good crop of dry padi, although on some pieces of land yields of from 370 to 380 gantangs of padi per acre were obtained, which would be regarded as a good yield on Kelantan standards for a main crop of wet padi. No confidence was felt that the smallholders taking part in the trial had given of their best and had made any real attempt to grow a crop of padi, and there appear to be fair grounds for considering that the average yield per acre could have been doubled had rather more attention been paid to detail. Soil fertility in the area was sufficiently uniform to lead one to believe that variations in yield between under 50 and up to 380 gantangs of padi per acre were attributable to causes within the power of individual padi planters to remedy.

The demonstration and use of manured wet padi nurseries and an electric fence to protect off-season crops introduced two ideas new to the people living in the locality, the first of which is capable of immediate adoption with beneficial results. The use of manure on the growing crop was also demonstrated, and should go some way towards dispelling the preconceived idea that manuring is neither necessary nor desirable.

Mention has been made of the opinion that padi is not the only off-season crop that might be planted in such an irrigation area, but to a community with neither skill nor experience in the irrigation of dry land

crops it is without doubt the easiest one to grow. Without changes in the manner of distribution of water within the area, the raising of dry land crops would be very tricky, and at the present time particular importance is attached to an increase in the local production of padi.

The immediate application of the results of this trial to a large part or the whole of the Salor Irrigation Area is dependent upon the provision of means of cultivation of the land immediately after harvest of the main crop. That this can be done mechanically there is no doubt, and it is probable that considerable economies could be made in the 7½ tractor-hours work required per acre if the size of the fields could be increased. On the other hand, the limited period of time during which all cultivation must be completed suggests that even with some economy in the rate of working, 30 to 35 acres would be all that a light tractor such as a Ferguson would be able to accomplish if ploughing, harrowing, and rolling are all necessary operations. A mechanical solution to the problem of cultivation of say 2,000 acres, or roughly two-thirds of the land within the Irrigation Area, would therefore require a fleet of 60 tractors or more for use during a period of two months.

The use of cattle for cultivation of the land for the off-season crop may be considered in conjunction with their survival after the off-season crop has been planted. Any one individual usually has land of one type only, and except for a very small house site this land is padi land which is all flooded during the main padi season. Extensive flooding during the monsoon renders the provision of cattle fodder a most difficult matter, and it is during the off-season that the smallholder looks to the dry land to provide the grazing which is required to bring his cattle back into condition. If the cropping system of padi and beef is to be preserved, with the addition of another crop or crops, it seems clear that special provision will have to be made for the maintenance of cattle throughout the year by the growing of fodder crops for them. Practically without exception, no smallholder in Kelantan grows any fodder for his cattle, and for half the year they pick up what they can by wandering over fallow padi land. During the other half of the year they may be sold off to persons living in areas where there is more rough grazing land, or they may be tended by professional herdsmen for the duration of the padi season, or they may eke out a subsistence on roadside and *kampong* grazing supplemented by grass cut by their owners from *batas* in the padi fields and other areas normally inaccessible for grazing. At the conclusion of the padi season many of them are not in fit condition to do any work, and require some months of recuperation before they can undertake the annual task of preparation of the land for the padi crop.

If cattle are to be used, as one would prefer, for the cultivation of land for an off-season crop, arrangements would have to be made to ensure that a sufficient number of strong, healthy animals are available ready for work at the conclusion of harvest of the main padi crop, the number required being of the order of one head per acre of land to be

planted. Similarly, provision of foodstuffs for them on a more generous scale than usual would be needed for the duration of the off-season crop to ensure that they were fit to undertake ploughing and preparation of the land for the main crop three months later. So long as off-season cropping is restricted to relatively small portions of the State, as is represented by the Salor Irrigation Area, neither of these requirements presents an insuperable difficulty, and with some degree of organisation amongst farmers it should be possible to achieve, and a trade in the supply and maintenance of working cattle for use at Salor could be built up by persons outside that area.

Acknowledgements.

Appreciation is expressed of the services of officers of the Department of Agriculture who were responsible for the conduct of the trial in the field, who, with tractor drivers and workshop staff, succeeded in adhering to a strict time schedule.

Grateful thanks are also due to the Senior Drainage and Irrigation Engineer, Kelantan, and his staff for their co-operation and help, and to whom the data for water consumption are attributable.

SOILS OF THE NETHERLANDS

A Report on a Visit to the Netherlands to Study some of the Work being done on Peat, Sulphurous Soils, and Soil Survey.

I. PEAT AND SULPHUROUS SOILS

BY

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Introduction.

The study of peat soils and the development of high acidity in certain of the coastal clays following drainage are problems which have occupied the attention of the Soils Division of the Department of Agriculture for some years.

When the writer was on leave in the United Kingdom a visit to the Netherlands, where these problems are under intensive investigation, was undertaken from the 3rd to the 19th September, 1952.

The two major objects of the visit were thus:—

(a) To see some of the work being done on peat soils with special reference to the irreversible drying of these soils and to the use of trace elements.

(b) To examine the highly sulphurous 'cat' clays which are found in certain areas.

In addition the writer took the opportunity to:—

(i) Visit some of the areas which had been reclaimed and see some of the work being done on drainage.

(ii) Visit the Soil Survey Institute at Bennekom and see the organisation of the Soil Surveys.

(iii) Make short visits to several of the research laboratories and see any work which would be of special interest to Malaya.

General.

There are admittedly great differences between the soils of a temperate country and those of tropical Malaya; nevertheless there are many factors in the fundamental examination of soils which are common to all soil types and all countries.

There is a very vast difference in the emphasis placed on and the facilities granted for research in the Netherlands and in Malaya. The Netherlands, with a population of just over 10 million people, i.e. 272 persons per square kilometre, is the most densely populated country in Western Europe (10). It has few industrial resources and a large proportion of the population depends on one or other aspects of agriculture for its livelihood. Smallholders predominate; 42 per cent. of all agri-

cultural holdings are smaller than 12½ acres and 40 per cent. of all horticultural holdings are smaller than 2½ acres. The average yield of crop per acre must be the highest in the world, as is the consumption of fertilisers. The many research institutes working on agricultural research provide a fine example of how research has been used to increase production to high levels.

In planning for future agricultural expansion, increments in production are preferably expressed in yields equal to that of one hectare* at the existing yield level; thus a monetary evaluation of the improvements becomes possible by assessing the apparent gain of land (8). Experience has shown that if land already under cultivation is improved (by better control of drainage, manuring, etc.), then a capital investment of 5,000 guilders (£500 approx.) can bring about the same increase in yield as if one more hectare of unimproved land was added to the area. This provides a sound basis for comparing the cost of improving already cultivated land and of bringing new areas into cultivation.

General Description of Soils.

Alluvial soils form 50 per cent. of the soils of the Netherlands (1) and the study and mapping of these soils have received greater attention than anywhere else in the world. Of great importance are the marine alluvial soils. These are by no means uniform and their profiles reflect the different ways in which they have been formed. Soil surveyors in the Netherlands have found that it is necessary to understand the mode of formation of these deposits in order to make adequate maps. The age of the alluvial soils is of great importance; young alluvial soils are generally rich in calcium carbonate. Some of the alluvial clay soils of the brackish belt were deposited as black muds, poor in $CaCo_3$ but rich in FeS_2 (iron pyrites). After drainage these muds oxidise and form very acid soils containing free sulphuric acid. This gives rise to the so-called 'cat' clay which will be discussed later in this report. Edelman (1) states that in other coastal areas of the world similar very acid marine soils occur but have received little attention.

These marine alluvial soils are extensive in Malaya, i.e. the 'Coastal Alluvium'. The mode of formation of these large areas must have varied considerably, but we know little of the circumstances under which they were deposited.

River Clay Soils.

These are formed by the large rivers, i.e. the Rhine and Meuse. Bordering ancient branches of these rivers natural levees of permeable soils have been formed and these surround lower basins, the back-swamps of the natural landscape, with extremely heavy, impermeable, grey clay soils. (1).

* 1 hectare = 2.471 acres.

Sandy Soils.

Sandy soils cover extensive areas of the Netherlands; about 80 per cent. of these areas have been formed as wind-blown deposits, and podsols have formed under heath vegetation on the pure sand. Water conditions are limiting factors; if there is sufficient water these poor sandy soils can be rendered reasonably fertile by the use of chemical fertilisers. The height of the water table during soil survey is judged by the distance of the "glei" layer from the surface; where this is below 5 ft. the water table is regarded as too low for agriculture and the land is given over to forestry; where it is above 1 ft. the land is drained as much as possible and given over to grazing (1). The dune sand soils of the coast are some of the best man-made soils in the world. The bulb soils of the area around Lisse are situated in areas which were formerly sand-dunes and where the sand has been carted away to make roads. These soils are of almost incredible value and the secret of bulb growing lies in the maintenance of a stable water table throughout the year; it is kept at 22 ins., and it is stated that a rise or fall of 2 ins. can be detrimental.

Peaty Soils.

There is not so much physical resemblance between the peat soils of the Netherlands and those of Malaya, but chemically the oligotrophic peat (peat of low base status) and Malayan peat have much in common, both being low in bases and plant nutrients generally.

Peat is found in many parts of the Netherlands, the layers in different districts varying widely in development and in position (4). The most important peat districts of the Netherlands are as follows:—

(i) The low-lying peaty soils in the west. The area occupies large parts of the provinces of Utrecht, North Holland and South Holland. The greater part of the peat in this area was laid down in the boreal period (8000 to 5000 B.C.). In places the sea broke through and eroded away large blocks of peat and covered some of the others with recent, marine clay sediments. Sometimes a sequence of peat-clay-peat is found.

(ii) The low peaty soils in the north. These occur in the central and southern part of the province of Friesland and part of the province of Overysel, and

(iii) the high-lying peaty soils in the north. These occur in the provinces of Groningen and Drenthe, near the German frontier.

Botanical Composition.

The botanical composition of peat depends on the plant communities that once existed, and these are in turn related to the quality of the water at their disposal (4). If the water is rich in plant nutrients then an eutrophic peat (peat of high base status) will form. This is characterised

by reed peat, sedge peat or forest peat. When the water is poor in plant nutrients an oligotrophic peat is formed, generally Sphagnum moss peat. Although this is so entirely different in physical character from the peat of Malaya yet in chemical characteristics it has much in common since it is very low in plant nutrients. Besides containing many different kinds of Sphagnum, moss peat often contains the remains of heather and cotton grass. The forest peat generally contains timbers, but these are mostly very soft.

Often there is a sequence in the process of forming peat deposits. The peat begins as eutrophic and finally becomes mesotrophic (of medium base status) or oligotrophic. The area starts off by being covered with tree growth, pines, birches and alders. If the area has fairly rich drainage water flowing into it but is badly drained, reed and sedge peat begin to form. This gives the eutrophic peat. As this peat builds up, less rich drainage water reaches the plants and finally the mosses of the oligotrophic peat take over and these keep on forming.

There is not much original peat land to be seen in the Netherlands now as a great deal has been dug out; and even where it has not been dug out drainage has altered it to a considerable extent. Where digging was carried out lakes were formed and, where suitable, these were drained after surrounding them with strong embankments: these hollows form what are known as "Droogmakerii". It was not until the 17th century, when windmills had proved their usefulness, that the smaller of these peat areas could be drained, and the characteristic Dutch landscape resulted. Sometimes in the bottom of the lakes deep peat still remains, while in other parts nearly all the peat has been dug out, resulting in a thin layer of peat on clay subsoil or, if the subsoil is sandy, peat mixed with sand.

Drainage of Peat.

Drainage of peat always presents a difficult problem, and in Malaya this difficulty is increased by the large amount of timber. Not only does the timber hinder drainage operations but it also appears on the surface when the peat shrinks, thus leading to unevenness.

In the Netherlands two problems in peat drainage are differential shrinkage and the occurrence of creek beds. These creek beds, which are usually silty or sandy, are rather like our *permatang*[2] and become conspicuous in areas which have long been drained. Streams which formerly meandered through the areas built up levees and their own beds also became raised; when the peat shrinks both the levees and the beds appear above the general level and so lead to drainage problems. The effect of the differential shrinkage is that the surface of the peat becomes uneven and, since good cropping depends on a water table at a regular distance from the surface, this unevenness leads to difficulties. Another factor is that the level of the water table between drains is not convex as in ordinary mineral soils but concave so that it is at its lowest midway between two drains. This results in the peat in the centre drying out

more thoroughly than the peat near the drains so that it shrinks more and the highest soil is left near the drains. Also, when the peat is drained it finally cracks and these cracks may be quite deep and up to 1½ to 2 ins. wide. The sides of the cracks crumble and the peat assumes a hummocky outline.

In peat soils on which grass is grown, open drains about 50 yds. apart are used and the depth of water in them is kept at approximately 18 ins. Where the land is used for intensive arable cropping or market gardening a more intensive system of drainage must be used.

Irreversible Drying-up of Peat.

Peat by virtue of its colloidal nature can be irreversibly dried; once it has reached a certain stage of dryness it is extremely difficult to get it to take up moisture. The peat takes the form of discrete particles and assumes something of the nature of a coarse sandy material, i.e. it refuses to hold water and any rain falling on it just drains through it. Consequently, during a dry spell crops grown on it suffer from drought.

Dennett has stated, as long ago as 1933, that certain of the bare patches occuring on peat in oil palm plantations in Malaya were due to irreversible drying. He also put forward the view that too rapid drainage of peat areas is frequently disastrous as there is rapid shrinkage with considerable oxidation and, at the surface, a dry powder, almost impossible to recondition, is formed. From what the writer saw of the type of soil subject to drying out in the Netherlands, it would appear that Malayan peats are not often likely to undergo the same type of irreversible drying.

In the peaty districts of the Provinces of Utrecht and South Holland, where peaty soils are used as grass land, desiccation of the soil has taken place over quite a considerable area. At the worst, grass may be absent. The surface of the area is often irregular and root development in the soil is abnormal. The direct cause of this desiccation is having the water table in the ditches too low during dry periods. As a consequence of this, the water table in the soil falls too low in these periods and the upper layer dries out irreversibly. This means that the soil, once dry, does not take up water to reach its original percentage of moisture even when it is under water for several days (2).

However, all types of peaty soil are not equally liable to irreversible drying. Young moss peat of the Sphagnum type does not apparently suffer much nor are profiles of the Phragmites type or Phragmites-Carex type peat on the whole subject to serious desiccation. The type of peaty soil most likely to suffer from irreversible drying is that with a fairly high silt content, especially if situated on top of an impermeable layer below which the water table occurs in dry weather.

One of these peaty clays which suffers badly from desiccation is known as 'rodoorn' clay. This humus clay (20 to 30 per cent. humus) dries to give a hail-stone appearance and the resulting grains are very difficult to re-wet. The grains are regular in shape and are difficult to

PLATE I.

Newly reclaimed heath peat.

PLATE II.

Trench dug in peat area, with 'cat' clay underneath.

PLATE III.

Heath peat reclaimed some time ago. Note how the sand, originally placed on the top, has percolated between the sods of peat.

PLATE IV.

A profile of reclaimed polder soil with high calcium carbonate content.

pulverise. The irreversibility increases at higher percentages of iron, and if this is sufficiently high a red powdery soil is formed (7). Another type of soil which is said to suffer from irreversible drying is 'knip' clay. This is a soil, low in calcium but high in magnesium, which was laid down under marine conditions. It is generally found that the tendency to irreversible drying decreases considerably when the humus content increases to over 50 per cent.

Peats which are subject to desiccation dry out more readily when placed under glass. In the western peat district the writer saw peat under glass being flooded in order to re-wet it. Apparently, if soaked thoroughly, the peat may take up water again. In other cases, however, it is necessary to move the glass-houses to fresh sites.

The effect of desiccation when the field is under grass can be clearly seen, especially in fields with an uneven surface; the grass on the humps assumes a yellow, burnt appearance, while that in the hollows is quite green. A sod cut from the dried out material has a greyish-white appearance whereas the material which has not suffered irreversible drying is blackish-brown in colour.

The drying out of these peaty soils under grass is causing considerable concern, and various experiments are being carried out to try to reverse the process and re-wet the soils. The treatments which have been tried are liming, addition of organic matter and sub-soil irrigation. Sub-soil irrigation consists of raising the water table from 24 ins. to about 8 ins. using tile-drains as a sub-soil conveyance. It has been effective in doubling the yield of grass. The chief draw-back is its expense, because to be effective the fields need to be levelled. A method has been worked out by Hooghoudt (2) for determining the degree of irreversible drying, and samples are frequently examined by this method.

Cropping of Peat.

The low-lying peats of the west are utilised for dairy farming, and most of the farms consist almost entirely of grass-land; in other favourable parts of the west intensive horticulture is practised on the peat. It is stated that the peat soils are not suitable for permanent pastures because the soil is so soft that after a few years it becomes closely packed. To counteract this and the irregular shrinkage, the soil is ploughed every 10 to 15 years and then cultivated for one year. Small grains are commonly sown as a nurse crop for the grass. The high peat soils of the east, which have been reclaimed from moorlands, generally overlie sand and there has been a general admixture of sand. These soils are heavily manured with artificial fertilisers and grow excellent crops of oats, rye and potatoes.

Manuring of Peat Soils.

A striking fact to one accustomed to Malayan conditions is the very large quantities of fertilisers and organic manures used on peat soils in the Netherlands. These peats do not appear to have much inherent ferti-

lity but they provide a suitable physical medium for the growth of crops. The use of organic manures and heavy dressings of nitrogenous fertilisers are of particular interest. In the grass-growing areas heavy manuring is carried out; up to 150 lbs. per acre of nitrogen, mostly in the form of nitro-chalk, is given, superphosphate and basic slag are added and, if hay is being taken, a dressing of potash is also given. In the horticultural areas very large dressings of farmyard manure, mostly horse manure, are supplied annually; in certain cases up to 200 tons per acre. Additional organic matter in the form of straw is also often added, especially for cucumbers. It was stated that these heavy dressings of organic manure could help in three ways; they help to prevent phosphate fixation; they could prevent aluminium toxicity and they may help to prevent irreversible drying of the peat. In certain cases liming is also carried out on the horticultural soils of the western peat lands. This is generally applied at the rate of 4 tons per acre calcium carbonate (ground limestone) and 4 tons per acre slaked lime. In the reclamation of the heath peat soils of the north-east, heavy dressings of potash fertiliser (40% K_2O) of the order of 1,000 lbs. per acre are given (4).

Trace Elements.

Copper and manganese are the two trace elements most likely to be deficient in peat soils. Deficiency diseases due to lack of copper, e.g. "reclamation" disease, are often found on newly reclaimed land of the heath peat type. This can be remedied by the addition of 50 lbs. per acre of copper sulphate. In the market garden soils copper deficiencies are rare due to the high applications of horse manure. In certain of the grass-lands of the western peat district, copper dressings are sometimes given and though there is no visible improvement in the grass it is said that the condition of the stock is improved.

Manganese deficiency primarily results from raising the pH. In areas where the pH is low there is generally no trouble from manganese deficiency, but when the pH has been raised, either through liming or application of heavy dressings of horse manure, symptoms of manganese deficiency can be expected. This is stated to be due to the fact that manganese in soils with pH values between 6.0 and 7.5 is oxidised to a not easily available form. The deficiency can be cured either by spraying the crop or applying manganese to the soil. Manganese deficiency in fruit trees can be cured by spraying the branches in winter with a 5 per cent. solution of manganese sulphate or, if in leaf, a 0.5 per cent. solution is used. The usual rate of application to the soil is 200 lbs. per acre of manganese sulphate.

Effect of Liming and Sterilisation on Peat Soils.

In glass-houses peat soil is sterilised regularly. Sometimes steam sterilisation is used; in other instances carbon disulphide, formaldehyde or D.D. (dichloropropane-dichloropropene) is used. When peaty soils are steam sterilised for the first time there is a considerable increase in soil

nitrates. Apparently this effect of sterilisation falls off after the first year. In the case of mineral soils, steam sterilising increases the water soluble potash. Graphs of bacterial numbers before and after steaming show that there is a rapid decrease, but after three months the numbers are greater than those originally. Carbon disulphide and formaldehyde had a slight effect on bacterial numbers but D.D. had none. The burning of peat as carried out by some of the Chinese market gardeners in Malaya may have similar effects to sterilisation, and there is no doubt about the beneficial results obtained from peat burning.

In the Netherlands, studies of the effect of liming on acid peat soils have shown that liming can greatly increase the amount of nitrogen available to crops. In one experiment, calcium carbonate was applied at rates up to 24 tons per acre. The original pH of the soil was about 4.2; 12 tons per acre $CaCO_3$ raised the pH to 6.0. The percentage of organic matter was determined in the control plots and in the limed plots after an interval of six years. The heaviest limed plots had only 2 per cent. less organic matter than the control after this interval. The effect of liming on soil nitrogen was studied by determining the response of potatoes and cereals to fertiliser nitrogen at different lime levels. In the first year after liming there was a slight indication that neutralising the acid peat soil gave an improved nitrogen uptake by the plants. In the following three years this uptake was much more pronounced, and the effect of liming on the nitrogen nutrition was still evident after five years. Examination of the microflora was also carried out and showed that liming produced a tremendous increase in actinomycetes. The bacterial counts also increased considerably as did the number of nitrifying bacteria (5).

'Cat' Clays.

The problem of these soils is in many ways similar to that of the sulphurous soils found in certain areas in Malaya. A great deal of research into the occurrence and formation of these 'cat' clays has been carried out, and the explanation of their formation is given below.

Silt deposits from sea water contain somewhat dark-coloured, hydrated FeS (ferrous sulphide) and some FeS_2 (pyrites). When the air gets access to these compounds the hydrated FeS quickly turns into ferric hydroxide and elementary sulphur. This does not need microbial assistance. The sulphur formed is further oxidised in the air by certain microbes (mainly *Thiobacillus thioxidans*) and transformed into sulphuric acid (6). This transformation proceeds more slowly than that of the FeS to elementary sulphur. The FeS_2 (pyrites) turns into $FeSO_4$ (6). The name 'cat' clay is given to these extremely acid soils in which pH values as low as 1 or 2 can occur, though values of 2 or 3 are more common. H_2SO_4, $FeSO_4$ and $Fe_2(SO_4)_3$ can all extract the exchangeable bases from the complex and also attack the clay fraction. $Fe_2(SO_4)_3$ can hydrolyse and form lemon-coloured basic iron sulphate and this is deposited along fissures and root cracks (9). A similar material can

be found on the newer bunds in certain swamp areas in Malaya. The ferric hydroxide formed on rapid oxidation of the ferrous sulphide is often deposited round the roots of plants to form the so-called 'iron pipes'. It has been found however that certain soils even though they have a high sulphur content are not inimical to plant growth. This is attributed to the fact that the sulphur occurs in organic form.

Before new areas are opened a survey is carried out and the amounts of sulphides and calcium carbonate in the soils are determined. From a standard graph it is possible to determine how much calcium carbonate is necessary to neutralise a given amount of sulphides. If sufficient carbonate is present then the soils are easily reclaimed since the carbonate neutralises the sulphuric acid formed by oxidation and calcium sulphate results. This is a better soil conditioner than calcium carbonate and the drained soils soon attain a good structure.

Reclamation of 'Cat' Clays.

It is recommended that when 'cat' clay has to be reclaimed the land should be well drained to allow the most soluble acid compounds to wash out, and then to apply lime. Even then, for the most acid soils, dressings of the order of 14 tons per acre of calcium carbonate are required. In certain cases the 'cat' clay may lie below an area of peaty soil, and if this is to be cultivated great care is taken not to bring the 'cat' clay to the surface.

In certain areas 'knik' or 'knip' clays are found. These are are marine soils with a high content of exchangeable magnesium and sodium but with low exchangeable calcium. This, it is stated, is due to the almost entire loss of calcium carbonate during the soil formation. The calcium carbonate disappears partly as a result of being used to neutralise the H_2SO_4 and $FeSO_4$ formed by oxidation of ferrous sulphide. The 'knik' clays generally have a poor texture and structure.

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NOTES ON CURRENT INVESTIGATIONS, OCTOBER TO DECEMBER, 1953.

Compiled by the Chief Research Officer and the Senior Agronomist

Padi.

Variety Trials.

Transplanting of all trials for the 1953-1954 season has been completed and reports from the field indicate that progress is satisfactory except at Temerloh where drought and pests have been very evident.

Variety Selection.

The 1953-1954 programme is proceeding normally.

Certain selected strains of Serendah Kuning in Negri Sembilan are in their final field trials and the best should be available for release on a limited scale next season. One strain of Nachin in Malacca which has maintained its superiority throughout the whole selection period is being multiplied so that final field trials and limited release may take place in the 1954-1955 season.

New selection work commenced this season comprises foundation stocks of Serendah Puteh at the Negri Sembilan stations and Machang at Titi Serong, North Krian, Perak.

Nutrient Requirements.

An investigation was commenced during the quarter on the nutrient requirements of the padi plant. Analyses (for N, P, K, Ca, Mg, Mn and Fe) are being made on plants of Siam 29 taken from unmanured plots in the Tanjong Karang Padi Test Station, Selangor. The samples will be taken at monthly intervals throughout the life of the plant.

Chlorosis.

Specimens of padi seedlings from a small area in Selangor were received which showed extreme chlorosis and stunting. The worst affected seedlings died back at an early age. Pot tests on seedlings grown in soil from the affected area indicated that iron deficiency was at least partially responsible for the symptoms.

Penyakit Merah.

Owing to the fact that the complex of conditions known as *penyakit merah* have been much in evidence this year, the opportunity has been taken to lay down test plots to discover whether the various symptoms are connected with unbalanced minor element nutrition.

These plots were established in each of the main padi-growing areas, and tests for possible soil mineral deficiencies in padi plants suffer-

ing from *penyakit merah* are made by spraying the plants with solutions containing various minerals. There is some evidence from Malacca that iron may be one of the deficient elements.

It was decided that a complementary series of chemical analyses of leaf samples should be carried out to compare the composition of healthy plants with those, from the same areas, suffering from *penyakit merah*, and determinations are being made of major and minor nutrients in leaf samples collected from different parts of the Federation.

Manurial and Agronomic Investigations.

An ambitious programme of manurial investigations is in progress. Excellent growth responses to fertiliser and cultivation have been noted in Kedah, Perlis and Negri Sembilan. Padi land on the east coast has, however, been very short of water and transplanting with overage seedlings has been reported from Kelantan, Trengganu and Endau in Johore. At the coastal Padi Test Station at Bachok, in Kelantan, wet padi seedlings had to be dibbled into dry soil. Further north, at Pasir Mas, nurseries were so old when the rains arrived that second nurseries, using short term Taiwan varieties, were sown for agronomic trials.

During 1953 an important new padi station was opened on poor acid soil at Padang Kemunting, Batu Rakit, Trengganu. A factorial trial involving liming, burning of surface peat and manuring was laid down but could not be planted until mid-October when 50-day old seedlings were planted.

An interesting observation on the effect of different methods of applying sulphate of ammonia on wet padi has been reported from padi land at Langgar in Kedah. Five plots were laid out with generous discards and 30 lbs. per acre of nitrogen was applied as sulphate of ammonia by the following five methods:—

A. Broadcasting on 4 to 5 ins. of water.
B. Plunging into the soil on a 2 x 2 ft. grid.
C. Plunging as in B but using paper packets of fertiliser.
D. As in C but using clay-fertiliser balls.
E. As in A but using pellets of sulphate of ammonia.

Observations on response of the padi indicated a colour change, which commenced five days after applications in the first three treatments with maximum effect noted after 15 days. Response was uniform in the case of treatments A and B but sharp lines of dark and light green were noted in the other treatments, which were slower to take effect. It was further noted that there was no lateral spread of nitrogen since the plot limits were clearly defined. This result was somewhat unexpected since considerable drift has been noted elsewhere in the past. It would seem, therefore, that broadcasting on water is the most economic method of application in rain-irrigated areas where water cannot be run off the land. The fact that the A and B plots were the earliest to lose their dark green colour suggests that frequent, small applications would prove superior to one large application.

Disease Control.

A survey of padi areas was completed during the quarter. Approximately 400 cultures were isolated from diseased specimens collected throughout the country; more than half of these cultures have so far been passed through the host (padi seedlings) in order to isolate pathogenic organisms from non-pathogens.

Pest Control.

With a view to using the insecticide EPN 300 against padi pests, a replicated experiment was carried out in the laboratory to determine the effect of the insecticide on fish. It was found that concentrations below 1 in 10 million had little effect on fish and thus it is concluded that an application of ½ lb. per acre EPN 300 (25 per cent. active) would probably not be harmful, providing the water was at least 6 ins. deep.

A pot experiment in randomized block arrangement has been started to investigate the control of padi stem-borers, using EPN 300 and Dieldrin. No differences are apparent after one month of growth.

Cacao.

Selection.

Some 2,500 pods were analysed during the quarter. Eight fermentations in baskets were carried out, but in general the bulk of beans available at one time was insufficient for satisfactory results. A bulk sample of 19 lbs. of wet Amelonado cocoa gave 7 lbs. of dry—a 37 per cent. recovery. The average bean weight was over 1 gramme.

Seventy seedlings resulting from a cross between Trinitario S.15 and Amelonado were planted in an observation plot in Field 47C at the Federal Experiment Station, Serdang. Trinitario S.15 has proved a promising parent in a progeny trial.

Manurial Trials.

In a factorial manurial trial at Jerangau Estate, Trengganu, girth measurements taken in November, 1953, have indicated, for the second year running, a significant linear response to applications of phosphate, using two parts of rock phosphate and one part of single superphosphate. A significant N K interaction showed that a double dressing of either nutrient alone was harmful but that both together had no effect. It is clear, therefore, that on this Rengam Series soil, derived from fine and medium-grained granite, young cacao requires only phosphate when grown under adequate jungle shade. Investigations in other countries suggest that young cacao will benefit from some nitrogen where it is exposed to higher light intensities.

A wilt of young plants of Amelonado cacao has been found to be associated with the use of fresh jungle soil both at Jerangau Estate and at the nearby Federal Experiment Station. The same wilt was not present

when soil from exposed areas was used in baskets. The cause of this wilt is not thought to be a pathogen and investigations are in progress.

Cacao Interplanted with Rubber.

A particularly promising cacao and rubber interplanting trial on an estate in Negri Sembilan had a severe set-back when the undergrowth flanking the cacao rows was slashed to the ground. The young cacao plants subsequently showed signs of scorch and dieback.

Seed-at-Stake Planting.

Observations on seed-at-stake planting of cacao have indicated that protection from rodent damage is likely to be an important factor in determining success.

Pest and Disease Control.

Helopeltis.

Routine dusting at Cheras Agricultural Station, Selangor, ceased with the treatment on the 21st July, 1953. Thereafter, weekly examinations were made to ascertain how long it would be before *Helopeltis* re-appeared; the incidence of any other insects was also recorded. It was not until 20 weeks after dusting ceased that the first fresh damage by *Helopeltis* was found. In earlier trials, before a regular dusting schedule was fixed, it had been found that the maximum safe interval between dustings was six weeks.

Ganoderma (Red Root Disease).

The present experiments on control of red root disease of tea should apply equally well to cacao. Recommendations for treatment have been made accordingly.

Oil Palm.

Progeny Trials.

Various trial and observation plots of pedigree Deli progenies, and of Deli x Pisifera material, have been planted.

Nutrient Requirements.

Leaf Analyses. "Bronzing".

The investigations on palms planted in 1939 in Field 4 at Serdang, have been continued and a total of 100 further leaf samples was collected for analysis during the current quarter. The term "bronzing" includes at least two distinct abnormalities,—"yellowing" and "orange spotting".

The examination of leaf samples taken at three-monthly intervals from immature palms of varying ages growing on an estate situated in the coastal area of Selangor is also continuing.

"Time of Felling" Experiment.

Felling of old palms, which was scheduled to take place in October in a "time of felling" experiment, had to be delayed because of the non-availability of mechanical equipment. These palms will now be eliminated by poisoning. It is very clear from this trial that if felling is delayed more than one year after under-planting with young palms, growth of the young palms is seriously retarded.

Pest Control.

The Rhinoceros Beetle *Oryctes rhinoceros* L. has caused some trouble on certain estates in Johore, breeding in old palms which had been poisoned prior to replanting. As long as breeding sites of rubber stumps and poisoned palms continue to be created by the estates themselves there is little that can be done to help them.

Coconut.

Pest Control.

Specimens of the nettle caterpillar *Parasa lepida* Cram. were received from an estate near Nibong Tebal, Province Wellesley, early in October and a visit was paid by the Entomologist. Only one tree was badly attacked and six others slightly. Parasitism was only about six per cent. in the original material received but a field count at the end of the month showed about 50 per cent. parasitism. The parasites were a species of *Apanteles*, several species of *Chalcidoidea* and a Tachinid. The presence of old cocoons on fallen leaves suggested that the attack was of long standing. Many caterpillars died from an unknown cause in the laboratory. In view of the increase in parasitism, the manager of the estate was advised not to employ insecticides. No further report has been received.

Fibres.

Ramie.

It is clear from a number of experiments with this crop that it requires a high standard of cultivation and heavy manuring on most Malayan soils. Decortication is reasonably easy where stems are grown quickly and harvested when still green.

A variety trial at Temerloh was completed during November. A similar trial in Selangor has been abandoned because of poor growth.

Manila Hemp.

In the experiment at the Federal Experiment Station, Serdang, on control of stem rot (*Marasmius subplexifolius*), spraying with a copper fungicide has not proved effective. In areas where attack by this fungus is likely to be severe the resistant variety Tangongon would be most suitable.

Mauritius Hemp.

This fibre plant on an observation plot on a degraded sandy soil in Penang has shown very uniform healthy growth.

This crop has been found to be easy to establish at Serdang, where young plants made a remarkable recovery from the effects of transplanting and dry weather.

Jute.

An experiment on the control of damping off of jute seedlings, caused by *Colletotrichum capsici* was completed. Seed treatment with Agrosan or Fernasan was found to be very effective, while mercuric chloride was considerably less satisfactory.

Tea.

Rooting Trials.

Some progress has been made in evolving a technique for rooting tea cuttings at Cameron Highlands. Trials are still in progress.

Results from a lowland rooting trial with 200 clones were most disappointing since the average rooting success, using standard ferning technique, amounted to only 7.9 per cent. with a range of 0 to 25 per cent.

A new trial with different media using natural high shade of *Erythrina subumbrans* augmented with light ferning revealed that the medium used was more important than frequency of watering. With the two most successful media—the first consisting of half coarse river sand and half weathered peat, the second of sand and jungle soil with added Krilium—rooting percentages averaged 62.5 and 71.1 per cent. respectively. This trial is of considerable practical importance since it indicates a way to reconcile the necessity for plenty of light for maximum rooting with the harmful effect of that light on texture of the rooting medium.

Disease Control.

With the onset of wetter weather towards the end of the year, the incidence of blister blight of tea at Cameron Highlands increased rapidly during November and December. During November, a slight attack of the disease also occurred on an estate in the lowlands of Perak.

Spraying and dusting experiments against this disease are continuing at the Federal Experiment Station, Cameron Highlands. In an experiment laid down on an estate at Cameron Highlands to discover the effect on yield of blister blight attack during recovery from pruning, an increase in yield over the first 10 months of 11.6 per cent. has been obtained by spraying.

Pest Control.

Two species of termite, *Microtermes pallidus* (Hav.) and *Odontotermes oblongatus* (Holmg.), have been identified from a tea

estate in Selangor. The first named can, under certain conditions, cause considerable damage to tea.

Pineapple.

Certain co-operative experiments on a south Johore estate have not been conducted correctly and have been terminated. The particular area is now dangerous from the security point of view and conditions do not favour precise experimentation.

Excellent uniform growth has been noted on the Federal Experiment Station, Jalan Kebun, Selangor. The peat on that station is well weathered and a considerable degree of mechanisation is possible.

Selection.

The clonal and mass selection plots at Jalan Kebun are now maturing and fruit characteristics are being recorded.

Fruit Growth Studies.

Decrowning of young pineapple fruits has been a usual practice by Chinese growers of the Singapore Spanish canning variety. However, since cultivation of pineapples has been developed on deep peat lands instead of clay soils, the incidence of broken core has increased, especially with decrowned fruits.

Various field observations and preliminary trials have been made, both on the Pineapple Experiment Station, Pontian, Johore, and on South Malaya and Jendarata Estates, and seem to indicate that broken core in pineapple is closely associated with interruption of a delicate balance of growth of the fruit. For example, the removal of the crown appears to increase the incidence of broken core, especially in fruit developed on younger plants. Similarly, plants grown in soil with insufficient or poorly balanced fertiliser seem to produce fruit with greater incidence of broken core.

A further experiment to determine (a) the effect of decrowning against not decrowning, (b) the effect of time of decrowning, and (c) the effect of high and low level of fertility of the soil is now being established at Jalan Kebun Experiment Station, Selangor.

Pest Control.

Mealy-bug wilt developed in two out of six Sarawak pines grown in pots and inoculated with 20 mealy-bugs per plant, appearing 69 days and 88 days after inoculation. The control plants have remained healthy and three of them are fruiting. One of the wilted plants has also produced a fruit, but the fruit is small and has a dried up appearance.

Mealy-bug wilt is present on pineapple plants at the Federal Experiment Station, Jalan Kebun, and a series of experiments has been suggested for the control of both the mealy-bug and the ants associated with it.

Pasture and Fodder.

The work in connection with the several experiments on pasture and fodder grasses at the Federal Experiment Station, Serdang, has continued.

Stylosanthes gracilis.

Excellent growth of *Stylosanthes gracilis* has been recorded from the Federal Experiment Station, Gajah Mati, in Kedah, in a hedge-row rubber interplanting experiment. This crop also thrives in Kelantan but monthly yields with a 40-day cutting cycle have varied from 19,062 lbs. per acre in July to 6,391 lbs. per acre in September with a slight recovery in November.

FESS Expt. 67. Guinea Grass. Time of Application Experiment.

The results of analysis of the samples received during the quarter indicated that the monthly application of fertilisers gave the highest yield and that the grass from plots manured at shorter intervals was highest in protein content.

FESS Expt. 126. Pasture Manurial Trial.

The object of this experiment is to determine the effect of applying N.P.K. in various combinations of 0, 1 and 2 proportions. The results will have to be examined statistically after the conclusion of the experiment. During the quarter, the grass samples from the plots receiving the highest rate of nitrogen and no potash appeared to have the highest protein content.

Vegetables and Food Crops.

In two rotation experiments on deep peat at Jalan Kebun, Selangor, both maize and sweet potatoes have grown quite well. Treatments involving a burn twice a year have shown up best to-date.

Yates' Jubilee Hybrid cabbage has grown extremely well at Cameron Highlands but heads are so large that they would suit only the hotel trade. Attempts are now being made to propagate this cabbage from cuttings.

Three bulked selections of Indonesian varieties of soya bean have been planted at the Federal Experiment Station, Kuala Lumpur.

A total of 201 selections of groundnuts was planted at the Federal Experiment Station, Serdang.

Disease Control.

In spraying experiments to control blight (*Phytophthora infestans*) of potato and tomato, copper fungicides appear to be generally most effective.

The incidence of bacterial wilt (*Xanthomonas solanacearum*) of potatoes was reduced by soil treatment with DD fumigant, and the yield of tubers significantly increased.

Fruit.

A banana manurial experiment at Ayer Hitam, Johore, commenced to fruit during November. Vigour of growth has been found to be very dependent on size of planting material.

In the experiment to test the susceptibility of several banana varieties to Panama disease, only the variety Embun has so far (15 months after planting) been attacked.

Cashew nuts in a variety trial at Ayer Itam, Penang, have grown well on poor, sandy soil.

Sapucaya nuts in a multiplication block at Serdang have grown unevenly; some seedlings come away well whereas others are very slow.

Coffee.

Rooting trials with Kalimas hybrid coffee have been carried out at the Federal Experiment Station, Kuala Lumpur, using three different media. The first trial gave from 50 to 75 per cent. established plants. Care was taken to use only vertically-grown cuttings-wood obtained from plants with their leading stems pegged down horizontally.

Both Kawisari and Kalimas hybrids have given low yields at Serdang, with a very low conversion rate of berries to beans. They would seem to be of no commercial value.

Livestock.

Goats.

There have been five fresh cases of *Melioidosis* at Serdang and the flock remains in quarantine.

The best average milk yield was recorded by a cross-bred (five-eighths) Saanan doe which gave 5.1 pints per day.

Poultry.

A feeding trial is in progress at six centres throughout the country. Growers fed on animal protein have reddened up earlier than those fed on vegetable protein and growth rate has also been slightly superior in some cases. The benefit of animal protein appears to have been more marked with cockerels than with pullets. Presence or absence of an antibiotic feed supplement has had no large effect on growth rate in those trials which are nearing completion.

Soils Investigations.

Soil Surveys.

The Geologist, Soils Science Division, has been seconded to Singapore for a period of three months from the 1st December, to make a critical survey of areas which may be used for growing vegetables.

Soil sampling of the Trans-Perak area has restarted, and a considerable number of samples has been received from the surveyors who

are taking soil samples at the same time as they are taking topographical levels.

Gelam Soils.

Stage II of the Sungei Raya Scheme in Negri Sembilan was visited and a number of soil samples taken. In addition to the fairly dense stands of young *gelam* which had grown or re-established on land previously cleared, a stand of long established virgin *gelam* was examined. Though there was not much evidence of a high sulphur content in the soil of other parts of the area, the soil bearing the virgin *gelam* appeared to be highly sulphurous. In places, pools of clear water occurred and these had a very strong smell of H_2S. Plant debris in the bottom of these pools was completely coated with a yellow-green slime. In the vicinity of these pools, there was little undergrowth. The soil was also of a heavier texture and contained a high percentage of clay in contrast to other soils of the area, which were predominantly silty.

The rate of oxidation of sulphur in *gelam* soils, as affected by liming, has been studied. A soil known to be high in sulphur was treated with lime at the rate of 10 tons per acre and spread in a thin layer. A similar amount, untreated with lime, was also spread out in a layer. Frequent determinations of sulphates and pH were carried out. The lime did not increase the rate of oxidation to sulphate but it prevented the pH from reaching such low levels. The pH of the unlimed samples dropped to 2.70 while the lowest recorded for the limed samples was 4.90.

Cation Exchange Capacity.

A further point under study is the effect of the acid conditions of *gelam* soils on the exchangeable bases and base saturation of these soils. The clay fraction of a large number of soils was separated by sedimentation and the base exchange capacity of these clays was determined by a semi-micro method. The method is very quick and gives good agreement between duplicates. Some of the clay fractions from the very heavy, sticky coastal clays of Krian, Perak, have cation exchange capacities of the order of 38 to 47 milli-equivalents per 100 gms. At the other end of the scale clay fractions from granite soils have values as low as 11 m.e. per 100 gms. These confirm the results noted in the previous quarterly report.

An investigation is also being carried out on the cation exchange capacity of soils. The conventional method, leaching the soils with a neutral salt, is much too tedious and lengthy to be of use for investigating a large number of samples. A colorimetric method using cupric acetate has been tried out and found to give satisfactory agreement with the conventional method. Furthermore, large numbers of samples can be examined in a comparatively short time.

Using the recently installed flame photometer, the exchangeable cations are being determined, and from this the degree of base

unsaturation can be calculated. This should give more fundamental information on the fertility status of Malayan soils.

Miscellaneous Pests.

Termites.

Close liaison has been maintained with the Public Works Department in connection with termite eradication in buildings and in means of preventing damage.

Patanga succincta (L.) (Swarming Grasshopper).

This large grasshopper has been present in six areas in the Raub district of Pahang and forms the subject of a special report now being compiled. Outbreaks are generally not severe in Malaya and records from 1921 onwards show no authentic case of total loss of crop in an area of more than 100 acres.

NOTES ON EXTENSION WORK, OCTOBER TO DECEMBER, 1953.

Compiled by the Chief Field Officer.

Padi.

It is expected that the acreage of main crop padi planted in the 1953-54 season will show an increase over that planted last season. This increased area is on the west coast and in Pahang where weather conditions have been generally favourable, but it is partly offset by a fall in the acreage planted on the east coast where the lateness and failure of the rains have created a serious problem. Crop prospects on the east coast are even less favourable than the fall in acreage indicates, since few farmers were able to resow the over-grown nurseries and substantial areas have been planted with stunted, over-age seedlings. Altogether 3,000 gantangs * of short-term Taiwan padi seed has been distributed to assist some planters who were unable to plant at the normal time. So serious a view is taken of the poor harvest prospects that a State Committee has been set up in Kelantan to investigate ways and means of stimulating off-season planting of crops other than padi.

The unseasonal weather has affected the sale of fertiliser in Kelantan. A campaign had been planned for what was hoped would be the first real step in the bulk sale of the recommended standard fertiliser at a subsidised price. Only 700 tons was sold, and at the beginning of the season it was confidently expected that sales would reach 2,000 tons. Progress in sales of fertiliser has been made in Kedah. Phosphatic bat guanos have been widely used for many years, but for the first time encouragement has been given to the use of rock phosphate and of sulphate of ammonia as a top dressing. Sales were 185 and 211 tons respectively.

Padi manurial demonstration plots were laid down extensively in Trengganu (110 plots), Malacca (120 plots) and Negri Sembilan (200 plots).

Rubber.

Distribution of improved planting material during the quarter totalled 20,743 yards of budwood and 1,090,668 clonal seedlings. Clonal seedlings continue to be much preferred by the majority of smallholders. The price has been raised to what is considered to be a commercial price of 15 cents per seedling, a substantial increase from the old subsidised price of 4 cents. This has resulted in an increase in the demand for budwood, particularly in Pahang, where new plantings are on an extensive scale. The State Agricultural Officer, Pahang, also reports that where clonal seeds have been provided at the cost price of 2 cents each, very satisfactory village or *kampong* nurseries have been established, with each owner caring for his own plot.

* 1 gantang = 1 gallon.

During the quarter, which is the period of the main seed fall, all States and Settlements have been actively engaged in establishing new clonal seed gardens. A total of 6½ million clonal seeds have been purchased for this purpose; the seedlings will be ready for planting out during the last quarter of 1954. New budwood nurseries have been established also, to an extent that will ensure adequate improved planting material to meet the replanting target and estimated requirements for new plantings.

Throughout the Federation special efforts are directed to encouraging and popularising rubber replanting. The following report by the State Agricultural Officer, Selangor, indicates briefly the wide field of activities:

> "Under Schemes 1 & 2, 1200 applications totalling 4,305¼ acres have been approved to-date. Of these, 1,065 applications totalling 2,809 acres have received the first and, in some cases, the second grant of money, while 29 applications totalling 113 acres have been approved for the grant but payment has not yet been made. Up to the end of November, $392,903 had been paid in replanting grants. The State Replanting Officer has organised a party to visit all *mukims* in the State in which there is any appreciable amount of rubber grown, to explain the replanting scheme. Visits will start at the beginning of December when the Register of Applications is again opened. Two Agricultural Assistants—one Malay and one Chinese—will accompany the party and special models showing rubber square-planted, avenue-planted and hedge-planted with various interplanted crops have been prepared. The State Replanting Officer, following a successful pilot scheme, is arranging for smallholders' rubber trees to be poisoned with sodium arsenite if required. Arrangements are also being made for the eradication, using proprietary oils, of lalang on smallholdings. The pilot scheme for supplying germinated clonal seed was not successful and it is not proposed to go further in the matter."

In pursuance of the policy of encouraging crop diversification where soil conditions are satisfactory, reports from Selangor state that 255 acres of old rubber land have been planted with coffee and 162 acres with coconuts as sole crops. In addition, substantial areas of newly planted rubber have been interplanted with other crops.

Fruit.

During the quarter, 6,923 budded fruit trees, mainly rambutans, were distributed from State and Settlement Agricultural Stations to new villagers and other members of the public. There is still an unsatisfied demand for planting material, and the stocks of seedlings laid down for budding have consequently been increased. It is gratifying to note that, in Perak, six private *kampong* fruit nurseries have been established and the owners have commenced selling budded plants in their districts.

Coffee.

In Selangor, 255 acres were planted with coffee under the Rubber Replanting Scheme, and the State Department distributed 7,010 seedlings as supplies for the smallholders.

Livestock.

Poultry.

Interest in poultry farming continues to increase and there is a heavy demand for pure-bred birds and hatching eggs. This demand is now being partly met by commercial poultry farms, especially in urban areas, and in the Kuala Lumpur district several large duck farms have been established.

State and Settlement Departments of Agriculture distributed 1,757 pure-bred birds and 1,488 hatching eggs during the period under review.

Pigs.

The numbers of pigs kept in new villages continue to rise and this increase is reflected by a fall in the prices paid for animals for slaughter throughout the Federation. There is still considerable interest in the rearing of Middle White half-breds and the Department is maintaining its effort to supply Middle White stud boars to the new villages. During the quarter, 147 animals were sold or distributed.

Fish.

There is an increasing interest in fish culture throughout the Federation and in some areas *Tilapia Mossambica* has become very popular and many new fish ponds have been constructed to rear this type of fish, which owes its popularity largely to its rapid rate of reproduction.

Agricultural Education.

A new emphasis is being placed on agricultural education as part of the Department's activities. Throughout the Federation 12 courses training people in general agriculture or in special techniques have been held during the quarter. At least 600 people have attended these courses.

In addition during the quarter, upwards of 30 special lectures and demonstrations have been given to audiences totalling almost 1,500 people. These demonstrations have interested audiences from many walks of life including *ketuas*, *imams*, members of Women's Institutes, schoolteachers, schoolboys, new villagers and Tamil labourers, the last-named witnessing the demonstrations while attending Civics Courses.

Hostels are being erected on Agricultural Stations with funds provided by the Rural and Industrial Development Authority. These

are used to house students and village folk undergoing short courses in general agriculture, or specialised courses in such subjects as poultry farming or fruit nurseries.

General.

In Selangor, the Malayan Film Unit has commenced making a film on poultry with the guidance and co-operation of the State Department of Agriculture.

The problem of re-settling demobilised Special Constables is being met in Selangor where a scheme to settle 300 families on 1,500 acres in Kuala Selangor District is under way. The basis of their economy will be coffee, probably interplanted with pineapples or vegetables. Smaller schemes for released Special Constables are proposed at Jeram Mengkuang in South Perak and in the Kuala Langat District of Selangor.

Review

MANURING OF RICE IN INDIA

By R. L. Sethi. Revised and brought up-to-date by K. Ramiah and T.P. Abraham. Indian Council of Agriculture Research, Bulletin No. 38. 122 pages. Price Rs. 5 or 8 shillings.

This is an excellent summary of the results of padi manurial experiments which have been carried out in India up to 1949. The results summarised are practically all from trials in experiment stations, and the authors point out the need for trials, both simple and complex, on cultivators' fields and mention the fact that the State of Bihar has, during the previous two years, laid down several thousand simple trials.

One criticism only may be made, and that is that it would have been better if the type of soil dealt with in each experiment had been included in the body of the report when describing the experiment rather than in an appendix.

The outstanding result from all the manurial trials in India is the universal response to nitrogen with a minimum dose of 20 lbs. per acre of N to give tangible results. The trials also show the superiority of ammoniacal nitrogen compounds over nitrate nitrogen compounds and also show that sulphate of ammonia is the equal of any of the oil-cakes. A further interesting fact is the usefulness of green manure, with a recommended rate of 6,000 to 8,000 lbs. per acre. Studies on the effect of combining organic and inorganic manure did not reveal any marked superiority for the combination over the "straight" fertilisers.

Time of application of nitrogen has also been studied, and though the results are not always consistent the general conclusion is that sulphate of ammonia or oil-cakes could be applied at any time from transplanting up to a few weeks before flowering without any appreciable difference in response. A few instances have been recorded where split applications gave better results, and in one experiment it was noted that late application of nitrogen increased tillering and helped the plants overcome an attack of gall-fly. Experiments on deep application of sulphate of ammonia and examination of residual effects of inorganic nitrogenous manures did not reveal any significant results.

Unlike nitrogen, phosphorus has not given a universal response, though in some areas there is a definite and consistent response. Many different phosphates have been tried but superphosphate and bonemeal are generally best. Placement trials with phosphate in areas where no phosphate response had been obtained do not give increases, though there are indications that soaking the seed could lead to a 10 per cent. increase. Residual effects of phosphatic fertilisers are evident in areas where there was a primary response but not elsewhere.

Other manurial trials included the use of lime, nursery manurial trials and the study of variety/manurial interactions. These did not give any startling results. An experiment to measure the lateral spread of sulphate of ammonia showed that it moved only very short distances. In an appendix there is a useful table giving yield equations and optimum doses for various ratios of cost of manure/price of padi. Another appendix includes a short discussion on minor elements.

In a general discussion the authors point out the rather baffling state of affairs in which the rice soils of many areas in India are deficient in phosphorus yet its addition does not give any appreciable response. They stress the need for investigation of this problem and also draw attention to the fact that when nitrogenous manuring with artificials becomes established practice, phosphorus deficiencies are liable to be accentuated.

J.K.C.

Departmental Notes

Honours and Awards.

Che. Ja'afar bin Mampak, Assistant Agricultural Officer, has been appointed an Honorary Officer of the Most Excellent Order of the British Empire.

Che. Ja'afar first joined the Department in 1924, and was Assistant Agricultural Officer-in-charge, Trengganu, from May, 1947, to December, 1953.

Mr. H. J. Simpson, Senior Agricultural Officer, has been awarded the Perak Meritorious Service Medal (*Pingat Jasa Kebaktian*). Mr. Simpson is State Agricultural Officer, Perak.

Tuan Haji Salleh bin Musa, Assistant Agricultural Officer, has been awarded the Kedah Meritorious Service Decoration.

Promotions.

Che. Omar bin Buyong, Agricultural Assistant, has been appointed Pupil Agricultural Officer, with effect from the 12th August, 1953.

Mr. Chew Hong Jung, Agricultural Assistant, has been appointed Pupil Botanist, with effect from the 7th September, 1953.

Appointments.

Che. Mohamad bin Jamil has been confirmed in his appointment as Agricultural Officer, with effect from the 25th September, 1953.

Mr. H. M. James, M.C., Agricultural Officer, has been appointed to act as State Agricultural Officer, Pahang, with effect from the 18th December, 1953.

Mr. A. L. Barcroft, Agricultural Officer, has been appointed State Agricultural Officer, Trengganu, with effect from the 1st January, 1954.

Mr. J. Chattaway, Agricultural Officer, has been appointed Senior Lecturer, College of Agriculture, with effect from the 8th January, 1954.

Mr. J. S. Ure, Agricultural Officer, has been appointed Settlement Agricultural Officer, Penang, with effect from the 8th January, 1954.

Leave.

The following officers have returned from leave:—

Mr. E. F. Allen, Senior Agronomist, on the 12th November, 1953.

Mr. J. Chattaway, Agricultural Officer, on the 7th December, 1953.

Mr. O. M. Lee, Principal, College of Agriculture, on the 4th January, 1954.

Mr. A. E. Billington, Canning Officer, on the 6th January, 1954.

Mr. G. W. Arnott, Chemist (Soils), on the 14th January, 1954.

The following officers have proceeded on leave:—

Mr. P. A. Gething, Senior Agricultural Officer, on the 17th December, 1953.

Mr. J. R. Milburn, Agricultural Officer, on the 21st December, 1953.

MARKET PRICES

October to December, 1953.

Rubber.—The Singapore price of No. 1 R.S.S., f.o.b., in bales, continued to decline during the last quarter of 1953. The price on the 2nd October was 62¾ cents per lb., but by the middle of that month it stood at only a little over 56 cents. By the 28th of the month the price had gone down to 53⅞ but recovered and was 56⅝ on the 31st. The average price for October was 57.61 cents per lb.

There was a slight decrease in price at the beginning of November but after the Deepavali festival there was a gradual increase to 60¾ cents on the 30th. However, the average price in November was the lowest for the year—57.21 cents.

December commenced with the price at 59⅝ cents; by the 9th it had increased to 60¾ but fell again and was 56⅞ on the 22nd. The average price for December was 58.47 cents per lb.

The average prices paid for smallholders' rubber at three towns in the Federation of Malaya during the fourth quarter of 1953 are given in Table I.

Table I.

Average Monthly Prices Paid by Local Dealers for Smallholders' Rubber, October to December, 1953.

(Dollars per picul of 133 1/3 lbs.)

Grades.	Taiping, Perak.			Seremban, Negri Sembilan.			Batu Pahat, Johore.		
	Oct.	Nov.	Dec.	Oct.	Nov.	Dec.	Oct.	Nov.	Dec.
Smoked Sheet	62.78	64.38	65.92	63.26	63.04	64.82	62.85	62.33	64.06
Unsmoked Sheet	49.84	51.09	52.78	46.31	45.28	46.66	52.02	51.17	54.85
Scrap	27.53	28.32	31.04	29.99	28.84	30.01	15.59	18.71	19.23

This Table has been compiled from statistics supplied by the Registrar of Statistics, Federation of Malaya.

Tea.—There were no public sales of Malayan tea in Colombo during the period October to December, 1953. The total public sales of Malayan tea in Colombo during 1953 amounted to 109,390 lbs. The

average prices paid for Ceylon teas at the sale held in Colombo on the 21st December, 1953, as quoted in the Weekly Report of the Colombo Brokers' Association, were, in rupees per lb.: High Grown Teas 2.19, Medium Grown Teas 1.94, Low Grown Teas 1.89.

In a return published by the Registrar of Statistics, Federation of Malaya, production of made tea in the Federation, as declared by estates, during 1953 was given as 3,992,837 lbs. black and 194,435 lbs. green teas.

The retail price of Malayan tea (Boh) in Kuala Lumpur remained at $2.60 per lb.

Derris.—The price of derris, as quoted in the weekly reports of the Singapore Chamber of Commerce, remained steady at $100 per picul throughout the quarter.

Rice.—The ration is 3½ katis * of Government imported and 1½ katis of commercially imported rice per week. The retail prices of rationed rice were decreased in December and are, in cents per kati: High Grade 38, Medium Grade 32, and Low Grade 21.

Table II.

Singapore Prices of Various Agricultural Products.

(Dollars per picul)

Date	Copra, Sundried	Coconut oil*	Pepper, F.A.Q. Muntok white	Pepper, Gen. Muntok white	Gambier, Cube	Sago Flour, Lingga	Tapioca Flour No. 1	Oilcake, Round
1953								
5th Oct. -	36.50	59.00	370.00	380.00	70.00	15.50	19.00	18.00
12th Oct. -	36.50	59.00	370.00	380.00	70.00	15.25	19.00	17.00
19th Oct. -	37.00	61.00	370.00	380.00	68.00	14.75	18.50	17.00
26th Oct. -	38.25	61.50	365.00	375.00	68.00	14.50	18.00	17.00
2nd Nov. -	37.50	61.00	345.00	355.00	68.00	14.75	17.75	16.50
9th Nov. -	37.50	61.00	340.00	350.00	68.00	15.00	17.25	17.00
16th Nov. -	36.75	61.00	335.00	345.00	68.00	15.25	16.00	17.00
23rd Nov. -	37.50	61.00	337.00	347.50	65.00	15.25	16.00	17.00
30th Nov. -	38.25	62.00	330.00	340.00	62.00	15.00	15.50	16.50
7th Dec. -	39.50	63.50	335.00	345.00	64.00	15.25	15.75	17.00
14th Dec. -	39.50	63.00	330.00	340.00	65.00	15.00	16.00	16.50
21st Dec. -	39.00	62.50	330.00	340.00	64.00	14.75	16.00	16.50
23rd Dec. -	39.50	63.00	330.00	340.00	64.00	15.00	16.00	17.00

* F.O.B.

The above prices are taken from the weekly reports of the Singapore Chamber of Commerce.

* 1 kati = 1⅓ lbs.

FEDERATION OF MALAYA

PRODUCTION OF PALM OIL AND KERNELS.

(In long tons as declared by Estates)

Month	Palm Oil		Palm Kernels	
	1952	1953	1952	1953
January	3,182	3,946	839	1,008
February	3,110	3,611	850	923
March	3,327	3,778	865	1,031
April	3,350	4,061	893	1,066
May	3,076	4,209	793	1,076
June	3,020	4,122	718	1,056
July	3,988	4,500	959	1,150
August	3,819	3,980	931	1,000
September	4,044	4,180	983	1,059
October	4,265	4,083	1,066	1,063
November	4,797	4,026	1,176	1,064
December	5,117	4,602	1,175	1,173
Total	45,095	49,098	11,248	12,669

In December, 48 estates (planted area 97,883 acres) were in production out of a total of 62 oil palm estates (planted area 106,921 acres).

MALAYAN AGRICULTURAL EXPORTS,

JULY-SEPTEMBER, 1953.

Product	Net Exports in Tons.			
	Year 1951	Year 1952	July-Sept., 1952	July-Sept., 1953
Arecanuts	13,547	10,467	410 *	1,809
Coconuts, fresh † ‡	32,540 †	94,024 †	20,115 †	24,538 †
Coconut oil ‡	68,139	65,113	14,093	15,908
Copra ‡	10,878 *	27,821	5,060	2,428
Copra cake	37,891	60,287	17,316 *	19,178 *
Gambier, all kinds	36	94 *	40	87 *
Palm Oil	45,022	46,008	10,614	13,804
Pineapples, canned	16,859	11,762	3,595	6,195
Rubber ¶	603,880 ¶	582,646 ¶	148,820 ¶	148,918 ¶
Sago,—flour	28,044	19,146	4,114	8,314
„ —pearl	3,401	5,553	1,186	1,454
„ —raw	27,603 *	24,835 *	5,560 *	7,586 *
Tapioca,—flake	462	39	35	55 *
„ —flour	4,475 *	4,075	599 *	2,598 *
„ —pearl	10,230	6,304	1,578	1,107
Derris	56	13 *	3	2
‡ Copra equivalent	100,499	79,868	18,243	23,914

¶ production (Federation of Malaya). † hundreds in number. * net imports.

FEDERATION OF MALAYA RUBBER PRODUCTION.

(In long tons, dry weight)

Month	Estates		Smallholdings (Estimated)		Total	
	1952	1953	1952	1953	1952	1953
January	27,044	31,354	23,770	23,514	50,814	54,868
February	24,007	23,423	19,200	19,140	43,207	42,563
March	25,679	26,898	20,810	16,882	46,489	43,780
April	25,533	26.155	19,068	16,805	44,601	42,960
May	27,362	27,820	18,346	17,679	45,708	45,499
June	27,243	27,202	20,333	17,024	47,576	44,226
July	29,473	30,188	20,299	20,400	49,772	50,588
August	28,301	29,511	22,052	21,491	50,353	51,002
September	28,690	28,934	20,005	18,394	48,695	47,328
October	29,369	30,064	18,856	19,202	48,225	49,266
November	31,827	28,985	18,855	19,250	50,682	48,235
December	33,800	30,583	22,727	21,894	56,527	52,477
Total	341,078 *	341,117	241,571 *	231,675	582,649 *	572,792
Total 1951	327,956		275,924		603,880	

This Table has been compiled from statistics published by the Registrar of Statistics, Federation of Malaya.

Smallholding production is estimated from purchases reported by dealers.

* These figures include an adjustment. The monthly production figures have not been altered.

FEDERATION OF MALAYA
PRODUCTION OF COPRA, COCONUT OIL AND COPRA CAKE.

(in tons)

Month	Copra Production						Coconut Oil Production		Copra Cake (Poonac) Manufactured	
	Estates		Smallholdings (estimated)		Total		Oil Mills		Oil Mills	
	1952	1953	1952	1953	1952	1953	1952	1953	1952	1953
January	2,740	2,555	9,296	8,241	12,036	10,796	6,681	5,597	4,244	3,594
February	2,777	2,405	8,510	6,092	11,287	8,497	6,338	4,236	4,016	2,694
March	2,864	2,793	8,522	6,703	11,386	9,496	5,616	4,800	3,647	2,981
April	2,964	2,753	8,684	7,972	11,648	10,725	6,128	5,294	3,949	3,379
May	3,279	3,306	8,560	8,744	11,839	12,050	5,797	5,666	3,820	3,633
June	3,643	3,357	7,642	9,842	11,285	13,199	6,067	6,478	3,960	4,078
July	3,846	4,196	11,294	9,718	15,140	13,914	7,177	6,699	4,075	4,308
August	4,151	4,070	10,357	11,179	14,508	15,249	7,645	7,935	4,902	5,048
September	3,848	4,103	12,426	10,332	16,274	14,435	8,292	7,789	5,014	5,043
October	3,358	3,890	10,757	11,998	14,115	15,888	7,622	8,808	4,981	5,607
November	3,103	3,137	9,569	11,265	12,672	14,402	7,214	7,776	4,695	4,900
December	2,950	3,565	9,225	9,580	12,175	13,145	6,608	8,381	4,278	5,157
Total	39,523	40,130	114,842	111,666	154,365	151,796	81,185	79,459	51,581	50,422

Notes:—1. The above Table has been compiled from statistics published by the Registrar of Statistics, Federation of Malaya.

2. Estate copra production and coconut oil production are as declared by estates and oil mills respectively.

3. Statistics of smallholding coconut oil production are not available.

4. Smallholding copra production for commercial purposes is estimated from the formula: imports + estate stocks (opening) + estate production + smallholding production = exports + local oil mill consumption + estate stocks (closing).

METEOROLOGICAL SUMMARY, MALAYA, OCTOBER, 1953.

Locality	Air Temperature degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine		
	Means of			Absolute Extremes									Number of days							
	A. Max.	B. Min.	Means of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot °F	At 4 feet °F	Total		Most in a day Amt.	Precipitation .01 in or more	Precipitation .04 in or more	Thunderstorm	Fog morning obs.	Gale force 8 or more	Total	Daily Mean	Per cent.
										ins.	mm.	ins.						hrs.	hrs.	
Ipoh, Perak	90.6	72.8	81.7	93.4	71.0	82.0	75.2			14.81	286.2	3.40	25	19	4	1		211.55	6.82	
Port Swettenham, Selangor	88.5	73.4	80.9	94.1	71.4	83.3	76.7	84.8	85.0	14.02	356.1	2.25	18	15	3			191.75	6.19	
Kuala Lumpur, Selangor	89.5	73.6	81.5	92.8	71.1	84.4	75.8			5.90	149.9	0.90	24	20	9	8				
Sitiawan, Perak	88.4	73.4	80.9	91.2	71.0	82.8	74.8	85.3	86.2	7.93	201.4	3.80	21	14	2	1		207.35	6.69	
Kuala Lipis, Pahang	89.0	71.9	80.5	91.1	70.2	85.3	74.0	83.5	84.6	8.83	224.3	2.04	19	16		30		186.10	6.00	
Kuantan, Pahang	88.6	71.5	80.1	91.0	69.2	84.9	73.5			10.69	271.5	2.69	20					197.20	6.36	
Temerloh, Pahang	89.7	73.7	81.7		72.2		75.1			6.69	169.9	2.39	19	14	3	8		186.95	6.03	
Bayan Lepas, Penang	87.2	74.6	80.9	90.8	72.1	81.8	77.0			9.98	253.5	2.14	23	20	1			207.05	6.68	
Malacca	85.9	74.0	79.9	89.0	72.0	83.7	75.9			8.28	210.3	4.20	7	14	2		1	226.40	7.30	
Mersing, Johore	88.1	71.2	79.7	93.2	69.3	85.6	73.9			6.55	166.4	3.21	14	11				216.20	6.97	
Alor Star, Kedah	88.1	73.7	80.9	92.0	71.2	82.1	76.2			10.78	273.8	1.89	25	23				200.05	6.45	
Kota Bharu, Kelantan	87.4	74.2	80.8	89.7	72.3	83.0	76.0	86.0		5.38	136.7	0.87	21	15	1			224.35	7.24	
K. Trengganu, Trengganu	87.0	72.5	79.7	90.0	71.1	81.7	74.6			3.34	84.8	0.98	14	9		2		227.00	7.33	
Kallang Aerodrome (S'pore)	88.3	75.3	81.8	91.2	73.0	85.2	77.8			2.01	51.1	0.64	11	8				188.70	6.09	
HILL STATION.																				
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	72.8	57.1	64.9	75.0	51.0	70.0	62.0			10.63	270.0	1.45	22					159.60	5.15	

Compiled from Returns supplied by the Malayan Meteorological Service.

METEOROLOGICAL SUMMARY, MALAYA, NOVEMBER, 1953.

Locality	Air Temperature degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine		
	Means of			Absolute Extremes						Total		Most in a day	Number of days					Total	Daily Mean	Per cent.
	A. Max.	B. Min.	Means of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min	At 1 foot °F	At 4 feet °F			Amt.	Precipitation .01 in or more	Precipitation .04 in or more	Thunderstorm	Fog morning obs.	Gale force 8 or more			
										ins.	m m.	ins.						hrs.	hrs.	
Ipoh, Perak	90.9	72.5	81.7	94.5	68.5	87.0	75.6			9.58	243.3	2.75	16	14	1			178.40	5.95	
Port Swettenham, Selangor																				
Kuala Lumpur, Selangor	88.9	73.3	81.1	93.8	70.4	81.2	75.3			7.17	182.1	1.92	16	12	5	5				
Sitiawan, Perak	88.1	73.1	80.6	91.6	70.4	82.2	76.2	84.5	85.8	8.12	206.4	2.05	16	14	3			150.85	5.03	
Kuantan, Pahang	86.3	72.1	79.2	91.0	69.7	75.0	76.6			9.64	244.9	1.45	19	15	3	6		122.00	4.07	
Temerloh, Pahang																				
Bayan Lepas, Penang	87.2	73.9	80.5	89.4	70.6	83.3	76.9			6.19	157.2	2.09	16	16	1			189.25	6.31	
Malacca	85.6	74.3	79.9	87.7	72.1	81.3	77.2			7.17	172.1	1.35	21	15	1		1	181.00	6.03	
Mersing, Johore	86.7	72.2	79.5	92.8	70.1	77.0	74.9			8.60	218.4	2.36	22	19				139.80	4.66	
Alor Star, Kedah	88.4	73.6	81.0	92.3	71.4	83.2	75.4			9.22	234.2	3.34	16	12				179.50	5.98	
Kota Bharu, Kelantan	85.2	74.2	79.7	90.4	72.0	76.2	76.4	83.2		23.45	595.6	3.00	24	21				146.05	4.87	
K. Trengganu, Trengganu	84.6	72.9	78.7	88.9	71.2	79.1	75.6			28.76	730.5	7.18	26	21	4	4		134.30	4.48	
Singapore	87.4	75.1	81.3	91.9	72.4	80.2	78.5			5.63	143.0	1.54	17	13				133.60	4.45	
HILL STATION.																				
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	72.6	57.0	64.8	78.0	47.0	69.0	62.0			9.04	229.6	1.84	16					128.75	4.29	

Compiled from Returns supplied by the Malayan Meteorological Service.